CERRO GRANDE FIRE
FLOOD FIGHT PLAN

DEPARTMENT OF ENERGY (DOE) SITES

PART 1-ADVANCE MEASURES AND EMERGENCY TECHNICAL ASSISTANCE PLAN

PURPOSE: Proposed is a two-part plan for the threat of potential flooding from approaching monsoon rains at Los Alamos County, Santa Fe County, Department of Energy, and tribal land. The threat was created by the Los Alamos fires of May 2000 that burned off the vegetation from the steep canyon slopes and baked the soil, potentially resulting in a dramatic increase in the amount of runoff from the monsoon rains. The intent of the first part of the plan is to outline advance measures projects for protection against flooding. The second part of the plan is intended to present flood fighting, monitoring, communication, and evacuation suggestions that will augment the Los Alamos County, the Department of Energy, the San Ildefonso Pueblo, and the Santa Clara Pueblo emergency contingency plans.

AUTHORITY: The Corps of Engineers is authorized to provide technical assistance and project construction that is requested by and funded by other federal agencies (i.e., Department of Energy, Bureau of Indian Affairs, Department of the Interior, Federal Emergency Management Agency).

Public Law (PL) 84-99 provides authority for the United States Army Corps of Engineers (USACE) to perform activities to protect against loss of life and damages to urban areas and/or public facilities due to flooding. Assistance activities to prevent damages may be taken prior to a flood.

DEPARTMENT OF ENERGY (DOE) REQUESTS FOR ASSISTANCE: The DOE requested technical assistance to identify areas at risk from the potential flood threat, make advance measures recommendations, design a solution to the risk, and construct the recommended solution. The following is an itemized list of risk areas and solution recommendations (See Figure 1).

SITE NO. DE-1: Los Alamos Reservoir

A. Facility Description: The Los Alamos reservoir is located in Los Alamos Canyon, about 1 mile upstream of West Omega road. This dam was built in the 1940's and is an earthen structure approximately 170 feet wide by 85 feet in height, with an estimated capacity of 25-acre feet. There is an existing spillway structure through the center of the dam that is potentially insufficient to address flows resulting from the design storm. There is a footbridge leading to a hiking trail and another across the crest of the dam.

B. Flood Control Recommendations: (See Figure 2) In anticipation of large quantities of debris flowing into the reservoir, it is suggested that both the footbridges be removed to prevent these

from acting as debris collection points. The downstream side of the dam should be cleared and grubbed prior to the placement of the articulated concrete mattresses (ACM). With an estimated runoff volume of 115 acre-feet, this dam is expected to overtop. It is recommended that articulated concrete mattresses (4.5 inches high upstream, 8.5 inches high on downstream) be placed from 30 feet below the crest on the upstream side of the dam, across the crest, and down to the toe of the downstream side of the dam. The articulated concrete mattress will anchored with soil nails in excess of those required by the manufacturer. Shotcrete will also be used to secure the outer edges of the ACM on the upstream side of the dam. As an additional protective measure, a concrete cutoff wall will be installed at the end of the stilling basin.

C. Additional Requirements: Corps geotechnical personnel will monitor the construction site during construction to identify seepage, movement, or any dangerous conditions that might develop and report these conditions to the design review team for analysis. Any unsafe condition will be reported to the project manager immediately. A notification and evacuation plan will be in place. The plan will identify DOE, County, Tribal Governments, and Corps offices to be contacted.

D. Schedule: This estimate includes the time it will take to do a preliminary design, contract, and complete construction. The estimated completion date for this project is 21 July 2000.

SITE NO. DE-2: TA-41: Box culvert

A. Facility Description: This is a facility located on West Omega Road in the bottom of the Los Alamos Canyon. There is an existing 8 foot by 15 foot culvert in front of the TA-41 facility, partially enclosed. The culvert is not expected to convey the predicted flow, and will potentially be congested with debris toward the beginning of the event. The purpose of any advanced measures would be to protect the facility by diverting water away.

B. Flood Control Recommendations: (See Figure 3) As a temporary measure to divert the water, standard highway barriers are suggested with a mass fill behind them to create a stable channel. Suggest that the barriers be placed on the north bank of the channel, directing water away from the facility, toward the parking lot. These barriers would connect with additional barriers placed at the beginning of the box culvert along the south side of the channel and along the entire length of the parking lot.

C. Additional Requirements: A suggestion for reducing the potential damage to the TA-41 facility is to open the topside of the box culvert, creating a channel. This would allow overtopping into the road. If this is done, then the barriers would need to be on the facility side of the channel (north side).

D. Schedule: An approximate time for completion of the work is two to three weeks.

SITE NO. DE-3: TA-02 Facility

A. Facility Description: This facility is located at the east end of West Omega Road. An open channel runs along the front of the TA-02 facility. The north edge of the channel is lined with concrete and the south edge has a gabion structure that is not secured in place. There is a fence encroaching into the channel along the upstream end of the channel, and a traffic bridge across the channel at both ends of the facility.

B. Flood Control Recommendations: (See Figures 4 and 5) The Corps concurs with LANL about removing the upstream traffic bridge to allow for better conveyance through the channel and relieve a potential debris collection point. It is recommended that the gabion structure be constructed along the existing channel and should be tied back with a 6 foot gabion structure at 90 degrees from the channel (Figure 4). It is suggested that the top unit of the gabion tie back be left off to encourage the excess flow through the pilot channel. This pilot channel should be excavated off the existing channel to encourage excess flow toward the road and away from the facility. LANL is currently removing debris from the upstream channel and relocating the fence line. Power poles can be protected with a diamond shaped structure of highway barriers, filled with random fill (Figure 5).

C. Additional Requirements: The fence at the downstream boundary should be examined as a potential debris collection point and some emergency procedures developed for leaving the road gates open**.**

D. Schedule: The estimated schedule for completion is between 2 and 3 weeks

SITE NO. DE-4: Two Mile Canyon at Highway 501

A. Facility Description: This structure is a normal roadway embankment for crossing over a culvert, and was never intended to retain water behind it. The culvert is not designed to pass the anticipated flow estimates.

B. Flood Control Recommendations: (See Figure 6) This embankment will be protected from overtopping scour failure by application of shotcrete. Approximately 1,530 square yards of 9-inch-thick shotcrete will be placed on the downstream face of the embankment. In addition, 1,290 square yards of erosion control mat will be placed along the downstream face.

C. Additional Requirements: The cost estimates and schedule are based upon a very rough estimate of quantities. Corps geotechnical personnel will monitor the construction site during construction to identify seepage, movement, or any dangerous conditions that might develop. Any unsafe condition will be reported to the project manager immediately. A notification and evacuation plan will be in place. The plan will identify DOE, County, Tribal Governments, and Corps offices to be contacted.

D. Schedule: A preliminary estimate for completion of this project is 30 July 2000.

SITE NO. DE-5: Pajarito Canyon at Highway 501

A. Facility Description: This structure is a normal roadway embankment for crossing over a canyon, and was never intended to retain water behind it. The culvert is not designed to pass anticipated flow estimates.

B. Flood Control Recommendations: (See Figure 6) The embankment will be protected from overtopping scour failure by application of shotcrete on the downstream embankment. Approximately 2,900 square yards of 6-inch-thick shotcrete will be placed on the downstream face. Prior to this, the embankment will reshape to a 1V:3H slope and the existing culvert will be extended.

C. Additional Requirements: The cost estimates and schedule are based upon a very rough estimate of quantities. Corps geotechnical personnel will monitor the construction site during construction to identify seepage, movement, or any dangerous conditions that might develop. Any unsafe condition will be reported to the project manager immediately. A notification and evacuation plan will be in place. The plan will identify DOE, County, Tribal Governments, and Corps offices to be contacted.

D. Schedule: A preliminary estimate for the construction of this project is approximately 4 to 6 weeks.

SITE NO. DE-6: Water Canyon at Highway 501

A. Facility Description: This structure is a normal roadway embankment for crossing over a canyon, and was never intended to retain water behind it. The culvert is not designed to pass anticipated flow estimates.

B. Flood Control Recommendations: (See Figure 6) The embankment will be protected from overtopping scour failure by application of shotcrete on the downstream embankment. Approximately 2,900 square yards of 6-inch-thick shotcrete will be placed on the downstream face. Prior to this, the embankment will reshape to a 3H:1V slope and the existing culvert will be extended.

C. Additional Requirements: The cost estimates and schedule are based upon a very rough estimate of quantities. Corps geotechnical personnel will monitor the construction site during construction to identify seepage, movement, or any dangerous conditions that might develop. Any unsafe condition will be reported to the project manager immediately. A notification and evacuation plan will be in place. The plan will identify DOE, County, Tribal Governments, and Corps offices to be contacted.

D. Schedule: A preliminary estimate for the construction of this project is approximately 4 to 6 weeks.

SITE NO. DE-7: Cañon del Valle at Highway 501

A. Facility Description: This structure is a normal roadway embankment for crossing over a canyon, and was never intended to retain water behind it. The culvert is not designed to pass anticipated flow estimates.

B. Flood Control Recommendations: (See Figure 6) The embankment will be protected from overtopping scour failure by application of shotcrete on the downstream embankment. Approximately 2,900 square yards of 6-inch-thick shotcrete will be placed on the downstream face. Prior to this, the embankment will reshape to a 1V:3H slope and the existing culvert will be extended.

C. Additional Requirements: The cost estimates and schedule are based upon a very rough estimate of quantities. Corps geotechnical personnel will monitor the construction site during construction to identify seepage, movement, or any dangerous conditions that might develop. Any unsafe condition will be reported to the project manager immediately. A notification and evacuation plan will be in place. The plan will identify DOE, County, Tribal Governments, and Corps offices to be contacted.

D. Schedule: A preliminary estimate for the construction of this project is approximately 4 to 6 weeks.

SITE NO. DE-8: Diversion from Pajarito to Cañon del Valle

A. Facility Description: In order to reduce the flow down Pajarito Canyon, which might impact facilities and transport soil downstream, it was suggested that a diversion channel be excavated from the river upstream of Highway 501 and be routed via topography down to the borrow pit located near "S" site. The following recommendations are based upon the following assumptions: 1) That accurate topographic data will be available, 2) that at some point Highway 501 will need to be crossed over or piped under, and 3) that the channel will be constructed according to engineering specifications.

B. Flood Control Recommendations: (See Figure 7) Based on cost estimates and time restraints, this measure is no longer considered a viable short-term option to be implemented by DOE. Rather, this may be studied by Los Alamos County as a potential long-term solution to flooding in Pajarito Canyon.

C. Additional Requirements: None.

D. Costs: NA

E. Schedule: NA

SITE NO. DE-9: Abandoned land bridge on Anchor Ranch Road

A. Facility description: This structure is located downstream of highway 501 on Two-mile Canyon. This structure was probably built with large rock and will be susceptible to seepage and

potential failure due to the flow through the structure.

B. Flood control recommendations: (See Figure 8) Geotechnical core samples for this site have been taken and analyzed. This site is being designed to retard flow into the canyon downstream. One of the 49-inch culverts will be seated completely and the second will have a restrictor plate welded to it to reduce its cross sectional area by 25 percent. The upstream face will be sealed with an application of shotcrete, while the downstream toe will be protected from excessive pore pressure by construction of a rock berm. Approximately 40 feet of the roadway surface will be degraded to act as an overflow section dumping into a recently constructed spillway section.

C. Additional requirements: None

D. Schedule: Estimated time for completion of this project is 21 July 2000.

SITE NO. DE-10: Anchor Ranch Road

A. Facility description: This structure is located within a secure area of LANL and will be constructed to comply with security requirements on Pajarito Canyon downstream of Highway 501.

B. Flood Control Recommendations: (See Figure 9) This embankment will be protected from overtopping scour failure by an application of shotcrete. Approximately 2,240 square yards of 6-inch-thick shotcrete will be applied to the downstream face of the embankment. In addition, approximately 1,200 square yards of erosion control mat will be placed on the downstream face to reduce erosion.

C. Additional requirements: Design can be finalized as soon as the core sample data has been received and analyzed, the above fix is based upon rough estimates and assumptions.

D. Schedule: A rough estimate of schedule for this project is 4 to 6 weeks.

SITE NO. DE-11: TA-18 Site

A. Facility description. This facility is located below where Two Mile Canyon and Pajarito Canyon come together next to Pajarito Road. This facility is highly sensitive, and cannot be damaged. The most sensitive building on this site is Kiva #1. LANL is currently contracting with Johnson Controls to build a sheet pile wall (.25 inch thickness) around this facility, tying in upstream to the north bank and tapering around the facility for approximately 1,000 linear feet. The current design suggest that the sheet pile need to be 1 foot high near to the north edge and tapering to a height of 3 feet at the corner of the facility, then back down to 1 foot at the downstream of the wall. This height differential is being adopted to accommodate the security requirements of line of sight.

B. Flood Control Recommendations: (no figure shown) We recommend that the sheet pile wall be of a consistent height. The conservative height is 5 feet, possibly as low as 3 feet, the full length

of the wall. It is also recommended that a fill material be put behind the sheet pile to create a mass to help retain structural integrity when deflecting large debris around the wall. The sheet pile wall should also have a tie back at the downstream end to discourage scouring around the backside of the wall.

C. Additional requirements: None

D. Costs: No costs done. LANL is currently contracting this work.

E. Schedule: No estimates on time calculated.

SITE NO. DE-12: Gabion weirs in Los Alamos, Pajarito, and Pueblo Canyons

A. Facility description: Due to the potential high flows through these canyons, materials will probably be transported downstream as far as Cochiti Lake. In order to prevent these materials from reaching the Rio Grande, the flows need to be slowed down enough to allow the sediment to settle out.

B. Flood Control Recommendations: (See Figure 10) It has been recommended that a series of gabion weirs be placed strategically down the canyons, for flow reduction and sedimentation control.

C. Additional requirements: An accurate topographic map is needed to identify the locations of these sedimentation basins. Pending additional calculations and design considerations will be necessary to identify accurate quantities and costs.

D. Schedule: This measure should be completed by 11 August 2000.

SITE NO. DE-13: Sediment retention structure

A. Facility description: Due to the potential high flows through these canyons, materials will probably be transported downstream as far as Cochiti Lake. In order to prevent these materials from reaching the Rio Grande, the flows need to be slowed down enough to allow the sediment to settle out.

B. Flood Control Recommendation: (no figure shown) This structure will be located upstream of TA-18, at the confluence of Two mile canyon and Pajarito canyon. The structure will be approximately 200 feet in width and approximately 50 feet in height. The purpose of this structure is to slow the flow of water down the canyon for two reasons: 1) The reduction of the flow will decrease the potential damage to the TA-18 facility and residences in the White Rock neighborhoods; and 2) The reduction in the flow will decrease the possibility of transport of contaminated sediments down stream.

C. Additional requirements: This structure is expected to protect all of the residences and facilities down stream once it is in place. This structure will have one 36-inch outlet pipe and be constructed on roller compacted concrete. The construction is expected to take approximately 25 days and there is a possibility of an event occurring during that time that will allow the flows down stream.

Measures will be taken to reduce or prevent this from happening. See the LANL Emergency plan a later section.

D. Schedule: Once the design is complete, the construction is expected to take approximately 25 days to complete.